Target-Oriented Clinical Skill Enhancement (TOCSE) Builds Up Confidence of Fourth-Year Medical Students During First-Time Patient Encounter: An Effective Bridging Tool After Online Didactic Undergraduate Classes During the COVID-19 Pandemic

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ABSTRACT

Background and Objective: Teaching clinical skills to undergraduate medical students has brought significant challenges during the COVID-19 pandemic. Patient discussion utilized hypothetical cases from history taking to diagnosis and management. Further, everything was delivered online. Target-Oriented Clinical Skill Enhancement (TOCSE) is a teaching and learning tool that integrates the basic medical sciences, such as anatomy, physiology, pathology, microbiology, and pharmacology, at the clinical level. TOCSE has been proven to improve the clinical performance of fourth-year medical students. However, clinical confidence remains an issue, especially for medical students on pure online mode of learning during the pandemic. Therefore, this study was undertaken to determine if TOCSE also facilitates the development of confidence in the clinical performance of 4th-year medical students during the first-time patient encounter after online undergraduate classes.

Methods: Eight-item Clinical Performance Confidence Scale survey was performed at three (3) time points of fourth-year medical student's rotation in the Department of Medicine: (1) prior to the deployment to the outpatient department (Pre-OPD), (2) after the first-time patient encounter without TOCSE workshop (Post-OPD no TOCSE), and (3) after the patient encounter with TOCSE workshop (Post-OPD with TOCSE). Mean and standard deviations were used to summarize the confidence level of the 4th-year medical students, based on the 10-point differential scale being 0 as *not confident at all* and 10 as *very confident*. Wilcoxon Signed Rank assessed improvements

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of confidence level from Pre-OPD to Post-OPD. Effect sizes were also calculated to compare the improvement in the items. All statistical tests were performed in SPSS version 26.0. P-values less than 0.05 indicate a significant increase in the confidence level of 4th-year medical students. **Results:** There is a significant increase in the clinical confidence of 4th-year medical students from Pre-OPD to Post-OPD no TOCSE (mean ± SD: 6.32 ± 1.02 to 7.06 ± 0.95, $p<0.001$). Comparing the eight items between Pre-OPD and Post-OPD with no TOCSE, performing a complete physical examination has the most remarkable improvement. Further, there is a significant increase in the clinical confidence of 4th-year medical students from Post-OPD no TOCSE to Post-OPD with TOCSE (mean ± SD: 7.06 ± 0.95 to 7.51 ± 0.89, $p<0.001$). The performance of a complete history-taking has the most considerable improvement (7.29 ± 1.03 to 7.89 ± 1.01, $p<0.001$). Correspondingly, the most significant increase in the clinical confidence of 4th-year medical students was seen among the Post-OPD with TOCSE compared to their Pre- OPD confidence scores (mean ± SD: 6.32 ± 1.02 to 7.51 ± 0.89, $p<0.001$). Among the eight items between Pre-OPD and Post-OPD with TOCSE confidence scores, the item on performing a complete physical examination has the most remarkable improvement (mean ± SD: 5.67 ± 1.37 to 7.20 ± 1.22, $p<0.001$), closely followed by performing a complete history-taking (6.53 ± 1.19 to 7.89 ± 1.01, $p<0.001$). The most significant improvements in clinical confidence were seen in all the items in the Post-OPD with TOCSE than in the Post-OPD with no TOCSE versus Pre-OPD confidence scores. In addition, with TOCSE, the number of medical students who scored 7.50 and above was amplified more than 3 times (17.4% to 58.7%, $p<0.001$, Pre-OPD vs. Post-OPD with TOCSE, respectively).
Conclusion: Target-Oriented Clinical Skill Enhancement (TOCSE) effectively builds up confidence during first-time patient encounter among fourth-year medical students taught online with hypothetical cases during their undergraduate classes.

Key Words: Target-Oriented Clinical Skill Enhancement, clinical confidence, clinical skill, fourth-year medical students, medical undergraduate challenge, online teaching in COVID-19 pandemic

INTRODUCTION

Generally, the training for acquiring clinical competence among medical students is embodied in two major phases of learning: preclinical and clinical.[1] The former starts with recognizing normal and abnormal signs and symptoms with hypothetical cases and progresses to history taking, physical examination, diagnosis, and management of warm-body cases in the clinical ward. At this stage, the students are still heavily under the supervision of faculty staff. The latter stage of clinical teaching happens in the last year and fourth year of medical schooling. The students are confronted with new patients in various clinical settings; emergency, outpatient, and ward. Although faculty-staff supervision remains, student presentation happens after all clinical tasks have been completed.

How confident can a medical student be in his last stage of undergraduate clinical training when faced with a sick individual? Brinkman and colleagues reported that among fourth-year medical students, self-reported confidence is not an accurate measure of competence in prescribing medications, with students needing insight into their strengths and weaknesses.[2] In a similar observation, the groups of Foong and Weier demonstrated an intermediate confidence level among graduating medical students in prescribing skills, applying basic sciences knowledge, and clinical context.[3,4] Didactic knowledge alone has not been shown to equate to confidence development. Early clinical exposure with ample time to patient encounters is a critical factor in acquiring clinical confidence among undergraduate medical students.[5-7] Communication skills with patients among fourth-year medical students have shown to be superior to first-year students, reflective of the basic knowledge and clinical training acquired thru the undergraduate years.[7] Several studies have shown that early clinical exposure to pathology and significant time to practice bedside procedures afforded opportunities to build confidence.[8,9]

Although clinical subjects have already been introduced in the second-year and third-year curricula, entering the arena of clinical application during the fourth year or clerkship still creates an atmosphere of uncertainty, competence and confidence issues, disconnection, and space for poor organizational skills compounded by differences in the level of clinical mastery by teachers. [1,10] Apart from

teachers regarded as assessors and supervisors in the student formulation of study strategies, they were likewise perceived as the source of student stress and anxiety [11]. This enormous challenge of imparting clinical skills to undergraduate medical students has been significantly compounded by the COVID-19 pandemic.[12,13] As a result, curricular restructuring resorting to online teaching has been implemented. Several teaching and learning strategies have been applied to offset the shortcoming of a virtual approach to clinical skill teaching. Online simulation and web-based resources have been utilized.[14] However, since social distancing is imperative in a pandemic, didactic knowledge and clinical skill teaching could only be applied to hypothetical cases. Foong and colleagues have reported that although virtual problem-based learning (PBL) during the pandemic improved students' understanding of basic didactic sciences, clinical confidence is lacking, and they remained concerned about passing clinical examinations and content acquisition.[13].

Our group has recently introduced the Target-Oriented Clinical Skill Enhancement (TOCSE), a teaching and learning tool [15,16] that has proven to be effective in bridging didactic knowledge to clinical skills and has enhanced the clinical performance of fourth-year medical students.[17] The experimental and control groups of medical students perceived the TOCSE tool as helpful in their graded clinical performance.[17] Whether the TOCSE tool can address the issue of confidence development among fourth-year medical students whose undergraduate years happened during the COVID-19 pandemic is a challenge for the current paper. This study was therefore undertaken to determine if TOCSE also facilitates the development of confidence in the clinical performance of 4th-year medical students during the first-time patient encounter after online undergraduate classes.

METHODOLOGY

The subjects were fourth-year medical students (N=109) during their two-months clerkship rotation at the Department of Medicine. An eight-item Clinical Performance Confidence Scale survey (Figure 1) was formulated based on the original TOCSE concept map [17] and was performed by the department's Clerkship Supervisor at three (3) clinical stages (Figure 2): (1) prior to the deployment to the outpatient department (Pre-OPD), (2) after the first-time patient encounter without TOCSE workshop (Post- OPD with no TOCSE), and (3) after the patient encounter with TOCSE workshop (Post-OPD with TOCSE). At the

Clinical Tasks	Not Confident At All (0)				Somewhat Confident (5)						Very Confident (10)
1. Review the different normal signs and symptoms	0	1	2	3	4	5	6	7	8	9	10
2. Review the different abnormal signs and symptoms	0	1	2	3	4	5	6	7	8	9	10
3. Perform a complete history taking	0	1	2	3	4	5	6	7	8	9	10
4. Perform a complete physical examination	0	1	2	3	4	5	6	7	8	9	10
5. Formulate relevant salient features based on the clinical data	0	1	2	3	4	5	6	7	8	9	10
6. Formulate plausible differential diagnosis/es, if any	0	1	2	3	4	5	6	7	8	9	10
7. Recognize and assess comorbidities, if any	0	1	2	3	4	5	6	7	8	9	10
8. Formulate an appropriate and comprehensive management plan	0	1	2	3	4	5	6	7	8	9	10

Figure 1. The eight-item Clinical Performance Confidence Scale survey

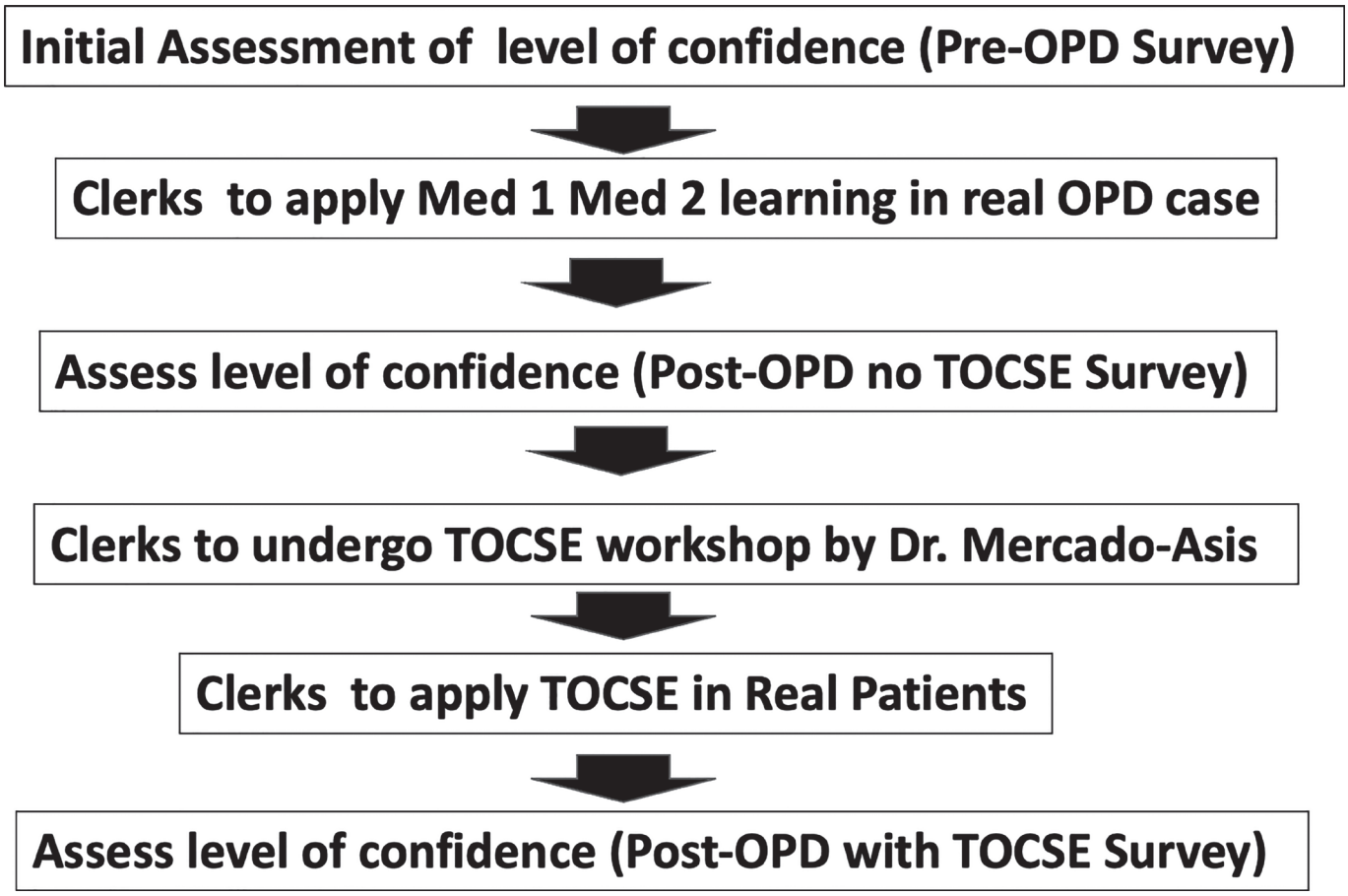

Figure 2. Algorithm of how the research was implemented depicting the three-staged survey: Pre-OPD, Post-OPD no TOCSE, and Post-OPD with TOCSE.

initial deployment, the clerks discussed their cases applying the knowledge they had acquired from Medicine 1 and Medicine 2 modules during their undergraduate years. The Pre-OPD and Post-OPD no TOCSE surveys of the students were made to be the control for the Post-OPD with TOCSE.

The students were blinded that research was being performed to avoid bias in their self-assessment. Informed consent from the students was obtained after the third survey. Figure 2 depicts how the program was delivered to obtain the desired study outcome.

RELIABILITY OF THE CLINICAL CONFIDENCE QUESTIONNAIRE

The researchers in this study formulated the Clinical Confidence questionnaire. It was initially composed of nine items, with a 10-point differential scale of 0 as *not confident* and 10 as *very confident*. The nine items were about 1) reviewing the different normal signs and symptoms, 2) reviewing the different abnormal signs and symptoms, 3) performing a complete history taking, 4) performing a complete physical examination, 5) formulating relevant salient features based on clinical data, 6) formulating plausible diagnosis 7) formulating plausible differential diagnosis/es, 8) recognizing and assessing comorbidities, and 9) formulating an appropriate and comprehensive management plan.

The reliability index of the nine-item questionnaire during Pre-OPD was 0.939, while at Post-OPD no TOCSE was 0.942, indicating acceptable internal consistency. However, for the Post-OPD with TOCSE, the reliability index of Item 6 was 0.580. Thus, it was decided to remove Item 6, leading to an eight-item questionnaire. After removing Item 6, the eight-item questionnaire leads to reliability indices of 0.935 during Pre-OPD, 0.932 for Post-OPD no TOCSE, and 0.930 for Post-OPD with TOCSE, indicating acceptable internal consistency.

STATISTICAL ANALYSIS

Mean and standard deviations were used to summarize the confidence level of the 4th year medical students,

based on the 10-point differential scale being 0 as *not confident at all* and 10 as *very confident*. In addition, Wilcoxon Signed Rank assessed improvements in confidence level from Pre-OPD to Post-OPD. Effect size as recommended by Rosenthal [18] was also calculated in the comparison of the items. All statistical tests were performed in SPSS version 26.0. A *p*-value less than 0.05 indicate a significant increase in the confidence level of 4th year medical students.

RESULTS

Table 1 shows that on all items, there is a significant increase ($p<0.05$) in the confidence level of the 4th-year medical students from Pre-OPD to Post-OPD no TOCSE. Comparing the eight items between Pre-OPD and Post-OPD no TOCSE, item 4 (performing a complete physical examination) has the most significant improvement reported by the 4th year medical students. It is followed by item 8 (formulating an appropriate and comprehensive management plan) and item 6 (formulating plausible differential diagnosis/es, if any). The criterion with the slightest improvement seen is item 5 (formulating relevant salient features based on clinical data).

Generally, results show a significant gain in the clinical confidence of 4th-year medical students from Pre-OPD to Post-OPD no TOCSE (mean ± SD: 6.32 ± 1.02 to 7.06 ± 0.95, $p<0.001$). Likewise, Table 1 shows that on all items, there is a significant boost ($p<0.05$) in the confidence level of the 4th year medical students from Post-OPD no TOCSE to Post-OPD with TOCSE. Among the eight items between Post-OPD no TOCSE and Post-OPD with TOCSE, item 3 (perform a complete history taking) has the highest improvement as assessed by the 4th year medical students. It is followed by item 7 (recognizing and assessing comorbidities, if any), and item 5 (formulating relevant salient features based on clinical data). The criterion with the least improvement is item 4 (performing a complete physical examination).

There is a significant increase in the mean score of clinical confidence surpassing the threshold score of 7.5 (for very confident) of 4th year medical students from Post-OPD no TOCSE to Post-OPD with

Table 1. Confidence level of 4th year medical students during Pre-OPD, Post-OPD no TOCSE and Post-OPD with TOCSE (N=109)

Items	Pre OPD	Post OPD no TOCSE	Post OPD with TOCSE	*p*-value
1. Review the different normal signs and symptoms	6.75 ± 1.12	*7.49 ± 1.10	*†7.92 ± 1.02	<0.001
2. Review the different abnormal signs and symptoms	6.20 ± 1.24	*7.02 ± 1.02	*†7.45 ± 1.06	<0.001
3. Perform a complete history taking	6.53 ± 1.19	*7.29 ± 1.03	*†7.89 ± 1.01	<0.001
4. Perform a complete physical examination	5.67 ± 1.37	*6.82 ± 1.25	*†7.20 ± 1.22	<0.001
5. Formulate relevant salient features based on clinical data	6.93 ± 1.08	**7.23 ± 1.09	*†7.77 ± 1.03	<0.001
6. Formulate plausible differential diagnosis/es, if any	5.90 ± 1.26	*6.74 ± 1.20	*†7.06 ± 1.11	<0.001
7. Recognize and assess comorbidities, if any	6.81 ± 1.27	*7.22 ± 1.23	*†7.83 ± 1.16	<0.001
8. Formulate an appropriate and comprehensive management plan	5.70 ± 1.38	*6.65 ± 1.24	*†7.00 ± 1.07	<0.001
AVERAGE	**6.32 ± 1.02**	***7.06 ± 0.95**	***†7.51 ± 0.89**	**<0.001**

Values expressed as mean ± SD, based on the 10-point differential scale.
*$p<0.01$, ** $p<0.05$ vs. Pre-OPD, *$p<0.001$ vs. Post-OPD no TOCSE.

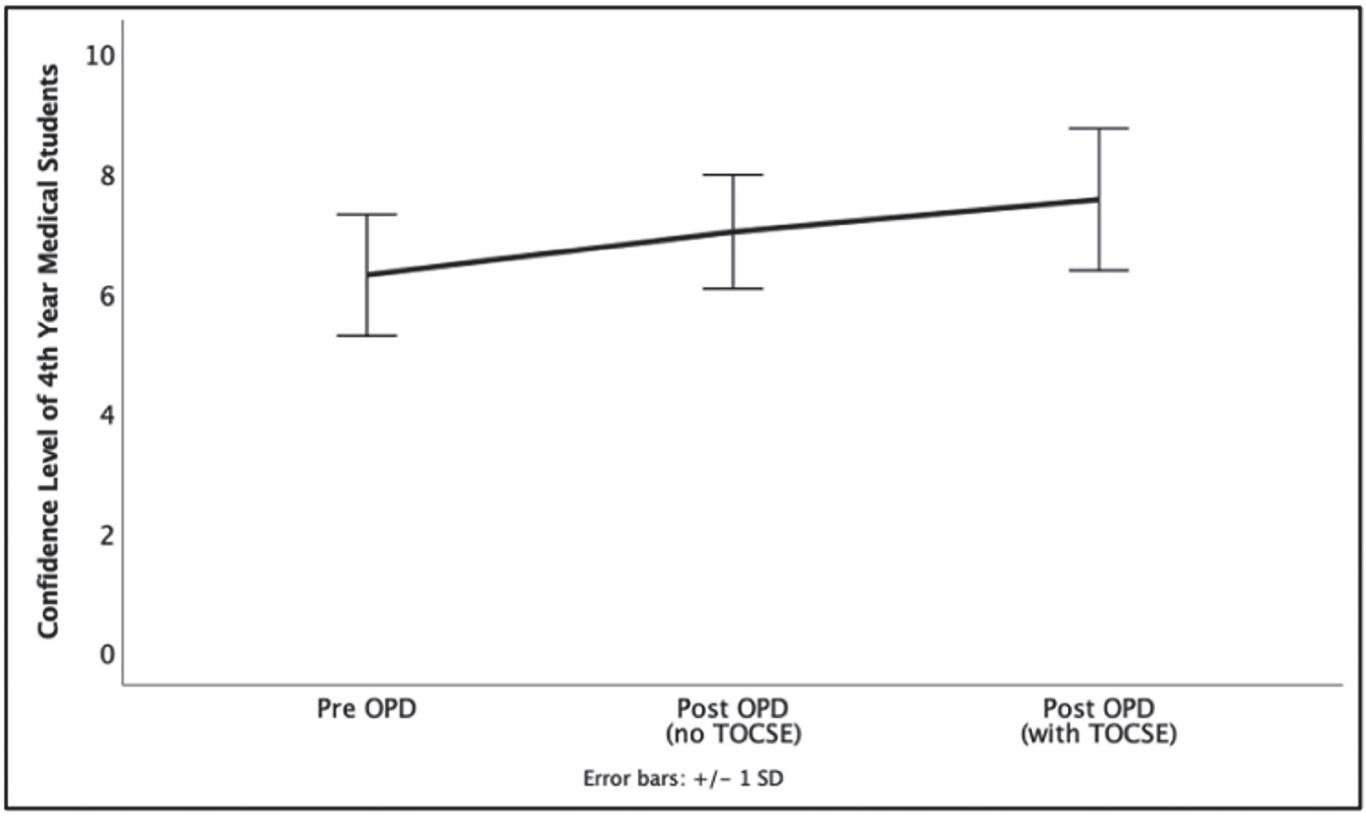

Figure 3. Confidence level of fourth-year medical students during the three-staged survey: Pre-OPD, Post-OPD no TOCSE, and Post-OPD with TOCSE. See Table 1 for *p* values.TOCSE; Target-Oriented Clinical Skill Enhancement.

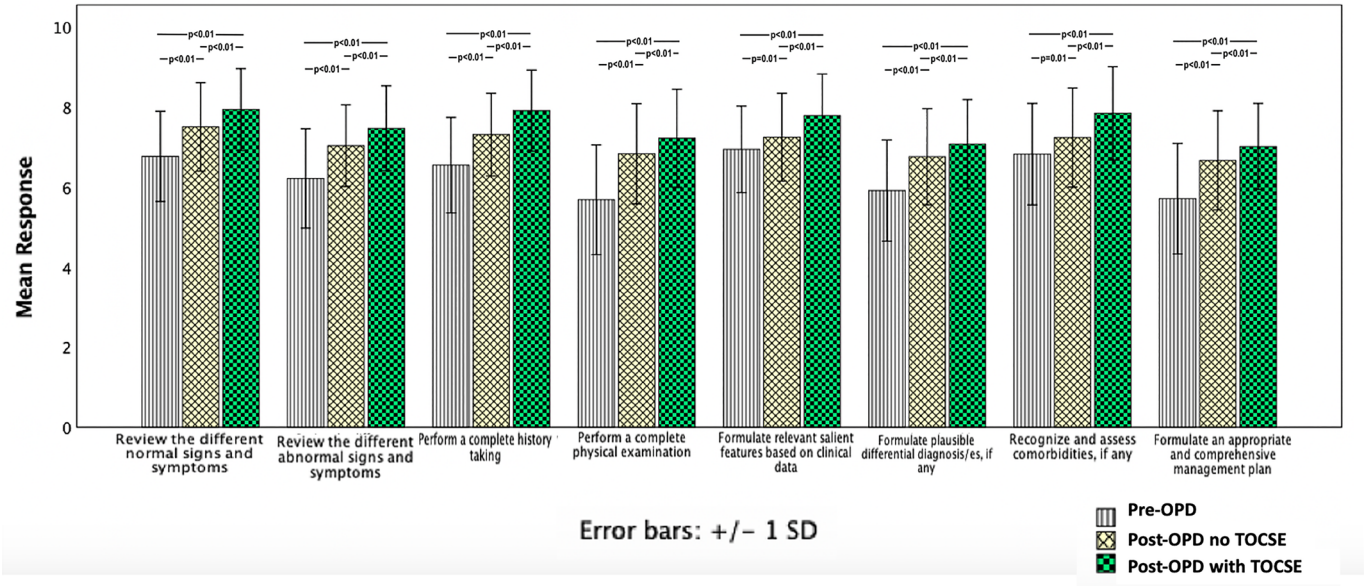

Figure 4. Comparisons of the eight-item in the clinical confidence questionnaire during the three stages of clinical skill performance survey of fourth-year medical students: Pre-OPD, Post-OPD no TOCSE, and Post-OPD with TOCSE. TOCSE; Target-Oriented Clinical Skill Enhancement.

TOCSE (mean ± SD: 7.06 ± 0.95 to 7.51 ± 0.89, $p<0.001$) (Table 1 and Figure 3).

Figure 4 shows the mean score of each item comparing the 3-staged survey (Pre-OPD, Post-OPD no TOCSE and Post-OPD with TOCSE), demonstrating the significant improvements in each item in the confidence level assessment of different clinical skill performance among fourth-year medical students from Pre-OPD and Post-OPD no TOCSE to Post-OPD with TOCSE.

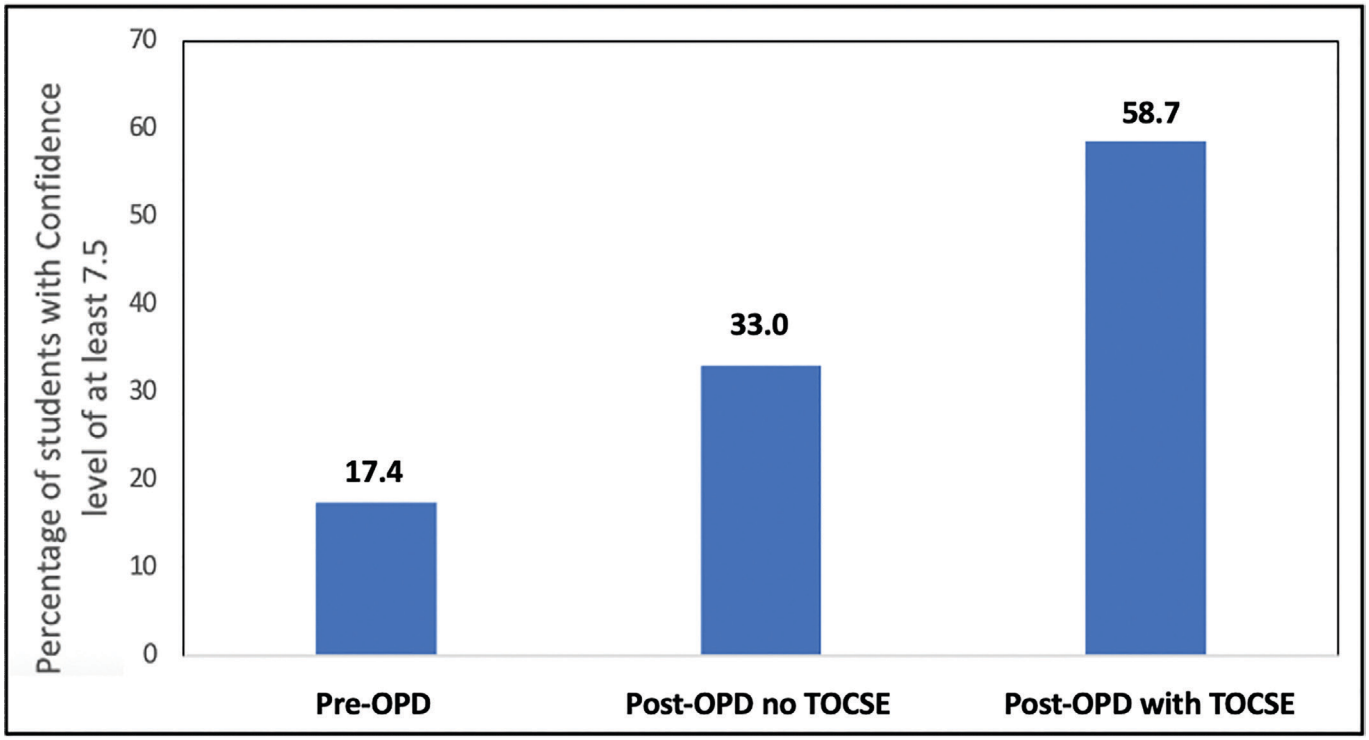

Figure 5. Percentage of fourth-year medical students who got at least 7.50 confidence level during the Clinical Confidence Survey during the 3-staged survey of Medicine rotation at the Ambulatory Care Service (ACS) department: Pre-OPD, Post-OPD no TOCSE, and Post-OPD with TOCSE.

Given the statistical findings, the calculated effect size is 0.78, leading to the statistical power of the test as 100%, which indicates that the samples are sufficient

During the Pre-OPD survey, 19 students (17.4%) got an average confidence level score of at least 7.50. After Post-OPD no TOCSE survey, 36 students (33.0%) scored an average confidence level of at least 7.50, demonstrating a significant increase (17.4% to 33.0%, p=0.007). Comparatively, in the Post-OPD with TOCSE survey, 64 students (58.7%) assessed their confidence level at least 7.50. Likewise, this showed a significant boost (33.0% to 58.7%, p<0.001) in the number of students scoring at least 7.50 from Post-OPD with no TOCSE to Post-OPD with TOCSE. Moreover, from Pre-OPD to Post-OPD with TOCSE, the number of medical students who scored 7.50 and above was amplified more than 3 times (17.4% to 58.7%, p<0.001) (Figure 5).

DISCUSSION

The importance of Clinical Confidence Development During Clerkship

Clinical confidence has long been recognized as a desirable attribute in producing competent physicians. One of the goals of medical education is to ensure that medical graduates gain confidence in their professional skills.[19] A doctor's confidence will influence his or her judgment in defending a clinical decision [20,21] and, more importantly, it reflects their prior and current attitudes toward becoming a safe doctor.[22] Confidence levels have been reported to correlate to reliable and decisive practice. [23]. An appropriate level of confidence is necessary in order to transform medical students into medical practitioners who can deal with the predicament of life and death situations [24,25] working independently without relying on supervision, as well as a motivator for graduating medical students not to give up after an initial failure. [21]

In a longitudinal study by Foong and colleagues, among graduating medical students, clinical reasoning, problem-solving, medical knowledge, and clinical skills only yielded intermediate confidence levels.[3] The group of Lai has reported an agreeable finding.[6] However, when surveyed at last six months prior to graduation, the medical students have merely moderate confidence in all practical skills. What seems to be the missing link?

Statistically Significant Findings that TOCSE is Effective in the Development of Clinical Confidence During Clerkship: What gap is being addressed?

Identified issues relating to preparedness for clinical skills and performance of fourth-year medical students

Although clinical subjects have already been introduced in the second-year and third-year curricula, entering the arena of clinical application during the fourth year or clerkship still creates an environment of uncertainty, incompetence, disconnection, and space for poor organizational skills compounded by differences in the level of clinical mastery by teachers.[1,10]. Interestingly, although clerkship directors also recognized students' struggles in performing clinical skills and adjusting to clinical cultures, they focused more on students' difficulties applying knowledge to clinical reasoning and engaging in self-directed learning. [26] Wenrich et al. further pointed out that students' expectations differ from faculty expectations which have been the cause of mounting students' anxiety. Students had higher expectations than both faculty groups for advanced skills preparation.[27]

Sahu and colleagues framed learning objectives of the best practices to impart clinical skills in clerkship, emphasizing a patient-centered approach and understanding the significance of pathophysiology in clinical presentations.[28] Medical schools must adopt essential teaching methods that will influence student understanding of basic practical clinical skills apart from simulated learning, lectures, multimedia instruction, and problem-based learning. [7] When fourth-year medical students were exposed to teaching basic anatomy, both their anatomical knowledge and measures of perceived confidence increased.[29] Day and colleagues have reported similar observations.[5] Although fourth-year medical students exhibited a higher passing rate in musculoskeletal medicine than their third-year counterparts, their confidence level was low and the same. Increasing exposure to the subject through clinical electives resulted in greater clinical confidence and enhanced performance on the exam.[5]

The preceding discussion implies that continued proactive integration of fundamental sciences of medical knowledge during clinical skill development across all undergraduate years of medical learning is integral in building clinical confidence among medical students.

The unique features of TOCSE

Target-Oriented Clinical Skill Enhancement or TOCSE is both a teaching and clinical tool which integrates basic medical sciences such as anatomy, physiology, biochemistry, pathology, and pharmacology at the clinical level.[15,16] Recently, in a randomized controlled study, TOCSE has been effective in bridging didactic knowledge to clinical skills and enhancing the clinical performance of fourth-year medical students.[17]

TOCSE's exemplary features evolved from its original conception as follows: 1) emphasis on risk factors for the primary disease, 2) formulating the concept map of the primary disease, 3) cropping the pathophysiology of chief complaint from the concept map, 4) writing the narrative of the chief complaint, labeling as "Anatomy of the Chief Complaint," 5) dissection of the anatomy of the chief complaint to reflect treatment for immediate relief, diagnostic and management approaches for the chief complaint, primary disease, and related contributory co-morbidities, and 6) overall abnormalities to correct in the patient as reflected in the history, physical examination, and concept map in general. Figure 6 shows students' output of a narrative and dissection of the pathophysiology of the chief complaint and the primary disease with diagnostic and management approaches. Emphasis on the risk factors, concept mapping of the primary disease, cropping of the pathophysiology of the chief complaint, and writing a narrative and dissection of its "anatomy" are three unique features of TOCSE and will be discussed accordingly.[17]

Starting case analysis with emphasis on risk factors are helpful for novice learners since risk factors are specific for age, gender, race, and family; thus, it narrows down differential diagnoses.[30,31] In addition, the onset of non-communicable diseases cannot be precisely discerned, and therefore risk factors are utilized to estimate the temporal onset of certain diseases like diabetes, hypertension, and obesity. [32,33]

Concept mapping(CM) in medical education has significantly influenced three critical areas: 1) linking basic sciences and clinical practice, 2) developing clinical reasoning, and 3) interprofessional and

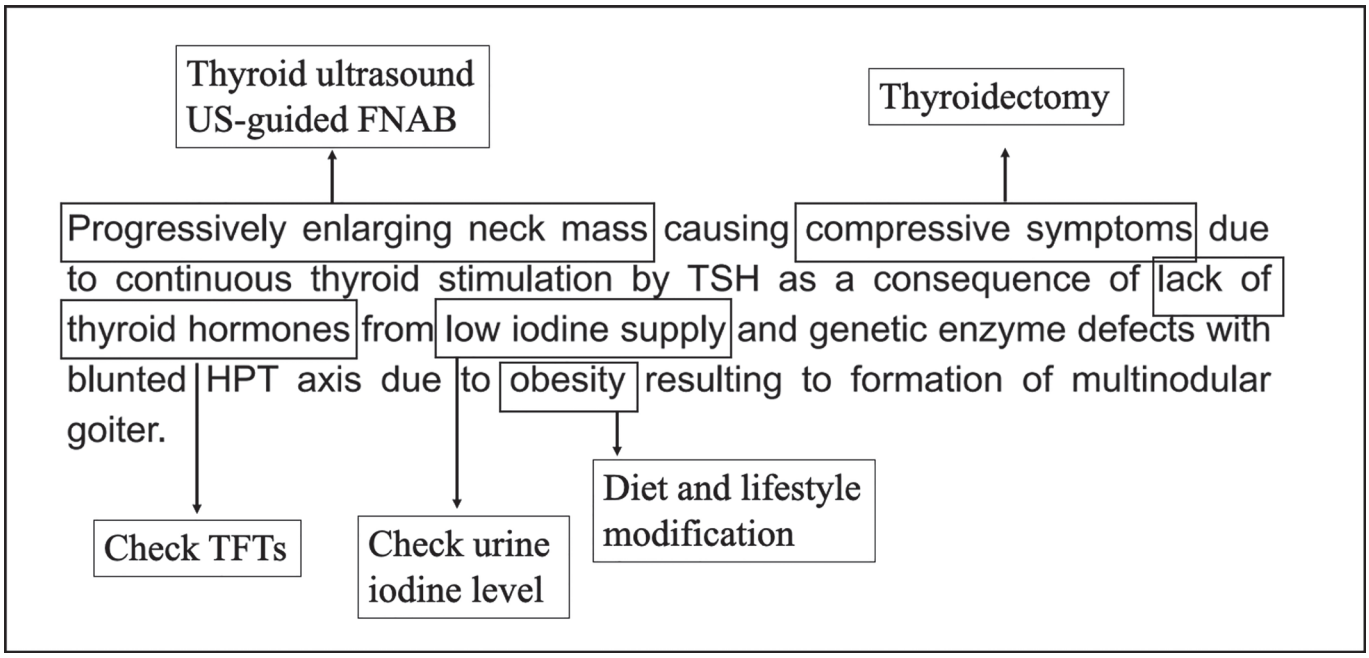

Figure 6. Students' output of a narrative and dissection of pathophysiology of the chief complaint and the primary disease with diagnostic and management approaches. US-guided FNAB; ultrasound-guided fine needle aspiration biopsy, TFTs; thyroid function tests.

group learning.[34,35] When CM methodology was introduced in medical education, it stimulated the learning of pathophysiological concepts and facilitated the dynamics of tutorial sessions. As a result, students could perform meaningful learning of pathophysiological mechanisms in the context of clinical cases.[36] In the report by Fonseca et al, the construction of mini-maps versus a global map interestingly created a heightened degree of collaborative learning among the tutors and students.[37] Further, concept mapping has also been shown to influence students' interest and motivation. For example, Bala and his group demonstrated how concept mapping increased students' awareness of HIV/AIDS, enhanced their pharmacotherapy knowledge, and improved their summative performance.[38] Baliga and their team have shown similar observations.[39] Over 50% of students scored full marks on the tuberculosis post-test versus their pretest scores. In addition, the students demonstrated positive responses (82.0%) using a concept map. Indeed, concept mapping is an aid for both meaningful teaching and learning. The graphical output reflects a cognitive framework and offers insight into a deeper understanding of basic medical knowledge fundamental to clinical application.[37]

The immediate relief of a chief complaint is essential in caring for a sick individual. Chief complaint-based clinical performance offers the opportunity to assess the quality and reflect the value of care delivered.[40] Confusion on which organ is involved primarily is offset if the pathophysiology of a chief complaint is dealt with.[41] Some chief complaints are accurate by definition (e.g., shortness of breath), but others are not (e.g., hematemesis that turns out to be hemoptysis). Therefore, providing a diagnosis and explaining the pathophysiology of the chief complaint may reduce the time interval to the institution of immediate relief.[41] In TOCSE, this dilemma is addressed with the dissection of the "anatomy" of the chief complaint supported by the formulation of the concept map of the primary disease, as shown in figure 6. [17]

TOCSE and development of clinical confidence among fourth-year medical students

Confidence issue in clinical performance was heightened in the subjects of the current study because these were medical students whose undergraduate learning was purely delivered through online mode because of the pandemic. The study's research design was made in such a way that the students themselves became the control (Figure 2).

As has been demonstrated in the previous reports having mastered the basic medical science during the undergraduate years is not an assurance of

acquiring the needed clinical skill and confidence in patient care during clerkship [2-4]. Application of basic medical knowledge with ample time of immersion into various clinical settings has been demonstrated to be the needed solution to the identified gap for clinical confidence development among graduating medical students. [5-9]

The current study has shown a significant increase in the clinical confidence of fourth-year medical students from Pre-OPD to Post-OPD with TOCSE. Further, TOCSE significantly boosted the number of students with high clinical confidence scores. The current research outcome reflects that TOCSE, as a teaching and clinical learning tool, has addressed the need and expectations of fourth-year medical students on how to apply their basic knowledge in the care of a sick individual. As discussed, meaningful learning comes about thru pathophysiology-based analysis of a case.[41-44] Moreover, thru concept mapping, cognitive framework and clinical mastery are developed, leading to an enhanced understanding of the case and heightened learner motivation.[37-39] Such has been deeply marked in the core attributes of TOCSE.

Interestingly, at any point of clinical teaching and learning, incorporating basic knowledge with ample time for clinical application are two essential contributory factors in developing significant clinical confidence. Lufler and colleagues reported that integrating anatomy teaching increased anatomical knowledge and improved measures of perceived confidence among fourth-year medical students.[29] When given enough time to practice, senior medical students could perform fundoscopy confidently and have greater confidence in recognizing papilledema. [9] Further, greater clinical confidence and enhanced performance in musculoskeletal Medicine have been observed among fourth-year medical students who had exposure to the subject by taking clinical electives. [5] Notably, there was a significant correlation between experience and clinical confidence.[8] Medical students with more than five times exposure to bedside procedures like venipuncture, placing foley catheter, arterial line and chest tube, lumbar puncture, paracentesis, and thoracentesis have significantly higher confidence. Likewise, students entering anesthesia, emergency medicine, and surgery residency training have been reported to have significantly higher confidence levels.[8]

CONCLUSION

The application of TOCSE to clinical work among fourth-year medical students during their first-time outpatient encounter on a background of online mode of learning during the undergraduate years has proven to be significantly effective in building up the clinical confidence of the senior medical students.

The important unique attributes of TOCSE, which have been elaborated to be essential as contributory factors in clinical confidence-building, are the incorporation of basic medical knowledge in every stage of case analysis and pathophysiologic-based digestion of the case supported with a concept map. Concept mapping by students is a driver for sharpening in-depth cognitive understanding of diseases at the clinical level.

Teaching and learning collaboration of students with teachers remain intact even if the latter stay on the side. Overall, student motivation, an essential aspect of learning, is enhanced with increased clinical confidence.

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